

AMENDMENTS TO THE CLAIMS

Claim 1 (Previously presented) An extrusion-free wet cleaning
5 process for post-etch Cu-dual damascene structures, the process
comprising:

providing a wafer comprising a silicon substrate and at least
one post-etch Cu-dual damascene structure, the post-etch
Cu-dual damascene structure having a via structure exposing
10 a portion of a Cu wiring line electrically connected with
an N⁺ diffusion region of the silicon substrate and a trench
structure formed on the via structure;

executing an oxidation step by applying a diluted H₂O₂ solution
to the wafer to slightly oxidize the surface of the exposed
15 Cu wiring line; and

washing away cupric oxide generated in the oxidation step
by means of a cupric oxide cleaning solution containing
diluted HF, NH₄F or NH₂OH having a pH of above 7.

20 Claim 2 (Original) The process of claim 1 wherein the Cu wiring
line electrically connected with an N⁺ diffusion region of
the silicon substrate serves as a cathode in the cupric oxide
cleaning solution.

25 Claim 3 (Original) The process of claim 1 wherein the method of
preventing Cu reduction reactions on the Cu wiring line
comprises purging inert gas onto the wafer during the
application to the wafer of the diluted H₂O₂ solution.

30 Claim 4 (Original) The process of claim 1 wherein the method of

preventing Cu reduction reactions on the Cu wiring line comprises adding a Cu corrosion inhibitor to the diluted H₂O₂ solution.

5 Claim 5 (Original) The process of claim 4 wherein the Cu corrosion inhibitor comprises benzotriazole (BTA).

Claim 6 (Previously presented) The process of claim 1 wherein the method of preventing Cu reduction reactions on the Cu
10 wiring line comprises reducing the H₂O₂ concentration of the diluted H₂O₂ solution to below 100:1 (v/v) of solvent to H₂O₂.

Claim 7 (Original) The process of claim 1 wherein the method of
15 preventing Cu reduction reactions on the Cu wiring line comprises lowering the temperature of the diluted H₂O₂ solution to below 15°C during the application to the wafer of the diluted H₂O₂ solution.

20 Claim 8 (Cancelled)

Claim 9 (Currently amended) A wet cleaning process comprising:
an oxidation step ~~comprising~~ incorporated with a means for
reducing Cu deposition on a cathode-like copper wiring
line of a Cu-dual damascene structure, wherein the means
25 for reducing Cu deposition on a cathode-like copper wiring
line comprises a step of purging an inert gas during the
oxidation process; and
an oxide etch step for washing away cupric oxide generated
in the oxidation step by means of a cupric oxide cleaning
30 solution.

Claim 10 (Original) The process of claim 9 wherein the oxidation
step is used to slightly oxidize a surface of a Cu wiring
line in a dual damascene structure by utilizing a diluted
5 H₂O₂ solution.

Claim 11 (Original) The process of claim 9 wherein the cupric
oxide cleaning solution comprises diluted HF, NH₄F, NH₂OH,
or diluted HF/HCl.

10 Claim 12 (Original) The process of claim 9 wherein the oxide
generated in the oxidation step comprises Cu₂O and Cu(OH)₂.

15 Claim 13 (Original) The process of claim 9 wherein the cathode-like
copper wiring line is electrically connected with an N
diffusion region of a silicon substrate.

Claim 14 (Cancelled)

20 Claim 15 (Original) The process of claim 9 wherein the process
of reducing Cu deposition on a cathode-like copper wiring
line comprises adding a Cu corrosion inhibitor to the diluted
H₂O₂ solution.

25 Claim 16 (Original) The process of claim 15 wherein the Cu corrosion
inhibitor comprises benzotriazole (BTA).

Claim 17 (Previously presented) The process of claim 9 wherein
the process of reducing Cu deposition on a cathode-like copper
30 wiring line comprises reducing the H₂O₂ concentration of the

diluted H_2O_2 solution to below 100:1 (v/v) of solvent to H_2O_2 .

Claim 18 (Original) The process of claim 9 wherein the process
of reducing Cu deposition on a cathode-like copper wiring
5 line comprises lowering the temperature of the diluted H_2O_2
solution during the oxidation step to below 15°C .

Claim 19 (Original) The process of claim 9 wherein the process
of reducing Cu deposition on a cathode-like copper wiring
10 line comprises increasing the pH of the cupric oxide cleaning
solution to above 7.
